CLAIMS

What is claimed is:

1. A head-cooling device for inducing hypothermia comprising:

a cap having an outer surface and an inner surface;

a first sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the first sealing member defining a first inner surface of the cap and a second inner surface of the cap, the first sealing member, the first inner surface of the cap, and a first portion of a head defining a fluid circulation space;

a second sealing member disposed on the second inner surface of the cap about a rim defined by the cap, the first sealing member, the second inner surface of the cap, and the second sealing member defining an aspiration channel;

a fluid inlet in communication with the fluid circulation space and configured to receive a cooling fluid from a fluid source via a positive gage pressure; and

an aspiration channel outlet in communication with the aspiration channel and configured to remove air from the aspiration channel, via a negative gage pressure, to seal the rim of the cap to a second portion of the head.

2. The head-cooling device of claim 1 wherein the aspiration channel is configured to retrieve fluid from the fluid circulation space and wherein the aspiration channel outlet is configured to remove fluid retrieved by the aspiration channel.

3. The head-cooling device of claim 2 wherein the head-cooling device comprises a fluid collection reservoir in communication with the cap, the fluid collection reservoir in fluid communication with the fluid circulation space and in fluid communication with the aspiration channel.

4. The head-cooling device of claim 1 wherein the head-cooling device comprises a fluid outlet in communication with the cap and in fluid communication with the fluid circulation space, the fluid outlet configured to allow egress of the cooling fluid from the fluid circulation space.

5. The head-cooling device of claim 1 wherein the head-cooling device defines a vent opening within the cap, the vent opening configured to maintain the pressure within the fluid circulation space at substantially atmospheric pressure.

6. The head-cooling device of claim 1 further comprising a body-cooling device in communication with the cap, the body-cooling device having:

a fluid distribution membrane defining a plurality of fluid jets; and

a heat transfer membrane attached to the fluid distribution membrane and configured to cover a body portion, the fluid distribution membrane and the heat transfer membrane defining a fluid circulation chamber.

7. The head-cooling device of claim 6 wherein the body-cooling device comprises a neck-cooling device, the neck-cooling device having:

a collar;

a first body-cooling module attached to the collar, the first body-cooling module having a first fluid distribution membrane defining a plurality of fluid jets and having a first heat transfer membrane attached to the first fluid distribution membrane and configured to cover a first neck portion, the first fluid distribution membrane and the first heat transfer membrane defining a first fluid circulation chamber; and

a second body-cooling module attached to the collar, the second body-cooling module having a second fluid distribution membrane defining a plurality of fluid jets and having a second heat transfer membrane attached to the second fluid distribution membrane and configured to cover a second neck portion, the second fluid distribution

membrane and the second heat transfer membrane defining a second fluid circulation chamber.

8. The head-cooling device of claim 1 wherein the cap comprises a flexible material and the head-cooling device comprises a substantially rigid shell in communication with the outer surface of the cap.

9. The head-cooling device of claim 1 wherein the fluid inlet comprises a swivel joint configured to allow rotation of an inlet connector relative to the head-cooling device.

10. The head-cooling device of claim 1 wherein the fluid outlet comprises a swivel joint configured to allow rotation of an outlet connector relative to the head-cooling device.

11. The head-cooling device of claim 1 further comprising at least one handle in communication with the cap and configured to allow positioning of the head-cooling device on the head.

12. The head-cooling device of claim 1 wherein the fluid inlet is positioned in proximity to the fluid outlet.

13. The head-cooling device of claim 1 further comprising a movement stabilizer component in communication with the outer surface of the cap.

14. The head-cooling device of claim 1 wherein the cap comprises a fluid distribution manifold removably coupled to the fluid inlet of the head-cooling device, the fluid distribution manifold configured to distribute the cooling fluid from the fluid source within the fluid circulation space.

15. The head-cooling device of claim 1 wherein the aspiration channel defined by the first sealing member, the second inner surface of the cap, and the second sealing member comprises a fluid absorption material.

16. The head-cooling device of claim 1 wherein the first sealing member defines at least one ventilation opening oriented between the aspiration channel, defined by the first sealing member, the second inner surface of the cap, and the second sealing member, and the fluid circulation space defined by the first sealing member, the first inner surface of the cap, and the first portion of the head.

17. The head-cooling device of claim 1 further comprising a third sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the third sealing member oriented between the first sealing member and the second sealing member.

18. The head-cooling device of claim 1 wherein the cap comprises at least one head support disposed on the inner surface of the cap, the at least one head support defining a fluid collection reservoir in fluid communication with the fluid circulation space and configured to contact the head.

19. The head-cooling device of claim 1 wherein the cap defines at least one flow channel disposed on the inner surface of the cap and in fluid communication with the fluid inlet of the head-cooling device and in fluid communication with the circulation space.

20. A cooling system for inducing hypothermia comprising:

a console having:

a housing;

a fluid reservoir in communication with the housing, the fluid reservoir

configured to hold a cooling fluid;

a positive gage pressure source in communication with the housing, the positive gage pressure source in fluid communication with the fluid reservoir; and

a negative gage pressure source in communication with the housing; and

a head-cooling device having:

a cap having an outer surface and an inner surface;

a first sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the first sealing member defining a first inner surface of the cap and a second inner surface of the cap, the first sealing member, the first inner surface of the cap, and a first portion of a head defining a fluid circulation space;

a second sealing member disposed on the second inner surface of the cap about a rim defined by the cap, the first sealing member, the second inner surface of the cap, and the second sealing member defining an aspiration channel;

a fluid inlet in communication with the fluid circulation space and in fluid communication with the positive gage pressure source to receive a cooling fluid from the fluid reservoir via a positive gage pressure; and

an aspiration channel outlet in communication with the aspiration channel and in fluid communication with the negative gage pressure source, the negative gage pressure source configured to remove air from the aspiration channel, via a negative gage pressure, to seal the rim of the cap to a second portion of the head.

21. The cooling system of claim 20 wherein the aspiration channel is configured to retrieve fluid from the fluid circulation space and wherein the aspiration channel outlet is configured to remove fluid retrieved by the aspiration channel.

22. The cooling system of claim 21 wherein the head-cooling device comprises a fluid collection reservoir in communication with the cap, the fluid collection reservoir in fluid

communication with the fluid circulation space and in fluid communication with the aspiration channel.

23. The cooling system of claim 20 wherein the head-cooling device comprises a fluid outlet in communication with the cap and in fluid communication with the fluid circulation space, the fluid outlet configured to allow egress of the cooling fluid from the fluid circulation space.

24. The cooling system of claim 20 wherein the head-cooling device defines a vent opening within the cap, the vent opening configured to maintain the pressure within the fluid circulation space at substantially atmospheric pressure.

25. The cooling system of claim 20 further comprising a body-cooling device in communication with the console, the body-cooling device having:

a fluid distribution membrane defining a plurality of fluid jets; and

a heat transfer membrane attached to the fluid distribution membrane and configured to cover a body portion, the fluid distribution membrane and the heat transfer membrane defining a fluid circulation chamber.

26. The cooling system of claim 25 wherein the body-cooling device comprises a neck-cooling device, the neck-cooling device having:

a collar;

a first body-cooling module attached to the collar, the first body-cooling module having a first fluid distribution membrane defining a plurality of fluid jets and having a first heat transfer membrane attached to the first fluid distribution membrane and configured to cover a first neck portion, the first fluid distribution membrane and the first heat transfer membrane defining a first fluid circulation chamber; and

a second body-cooling module attached to the collar, the second body-cooling

module having a second fluid distribution membrane defining a plurality of fluid jets and having a second heat transfer membrane attached to the second fluid distribution membrane and configured to cover a second neck portion, the second fluid distribution membrane and the second heat transfer membrane defining a second fluid circulation chamber.

27. The cooling system of claim 20 wherein the cap comprises a flexible material and the head-cooling device comprises a substantially rigid shell in communication with the outer surface of the cap.

28. The cooling system of claim 20 wherein the fluid inlet comprises a swivel joint configured to allow rotation of an inlet connector relative to the head-cooling device.

29. The cooling system of claim 20 wherein the fluid outlet comprises a swivel joint configured to allow rotation of an outlet connector relative to the head-cooling device.

30. The cooling system of claim 20 wherein the head-cooling comprises at least one handle in communication with the cap and configured to allow positioning of the head-cooling device on the head.

31. The cooling system of claim 20 wherein the fluid inlet is positioned in proximity to the fluid outlet.

32. The cooling system of claim 20 wherein the head-cooling device comprises a movement stabilizer component in communication with the outer surface of the cap.

33. The cooling system of claim 20 wherein the cap comprises a fluid distribution manifold removably coupled to the fluid inlet of the head-cooling device, the fluid

distribution manifold configured to distribute the cooling fluid from the fluid source within the fluid circulation space.

34. The cooling system of claim 20 wherein the aspiration channel defined by the first sealing member, the second inner surface of the cap, and the second sealing member comprises a fluid absorption material.

35. The cooling system of claim 20 wherein the first sealing member defines at least one ventilation opening oriented between the aspiration channel, defined by the first sealing member, the second inner surface of the cap, and the second sealing member, and the fluid circulation space defined by the first sealing member, the first inner surface of the cap, and the first portion of the head.

36. The cooling system of claim 20 wherein the head-cooling device further comprises a third sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the third sealing member oriented between the first sealing member and the second sealing member.

37. The cooling system of claim 20 wherein the cap comprises at least one head support disposed on the inner surface of the cap, the at least one head support defining a fluid collection reservoir in fluid communication with the fluid circulation space and configured to contact the head.

38. The cooling system of claim 20 wherein the cap defines at least one flow channel disposed on the inner surface of the cap and in fluid communication with the fluid inlet of the head-cooling device and in fluid communication with the circulation space.

39. The cooling system of claim 20 wherein the console further comprises a thermal

battery in fluid communication with the fluid reservoir, the thermal battery configured to reduce the temperature of the cooling fluid.

40. The cooling system of claim 20 wherein the console further comprises cardiopulmonary resuscitation equipment in communication with the housing, the cardiopulmonary resuscitation equipment chosen from the group consisting of a defibrillator, a chest compression system, or a cardiopulmonary ventilation system.

41. A method for inducing hypothermia in a body comprising:

placing a head-cooling device on a head of the body, the head-cooling device having:

a cap having an outer surface and an inner surface,

a first sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the first sealing member defining a first inner surface of the cap and a second inner surface of the cap, the first sealing member, the first inner surface of the cap, and a first portion of a head defining a fluid circulation space,

a second sealing member disposed on the second inner surface of the cap about a rim defined by the cap, the first sealing member, the second inner surface of the cap, and the second sealing member defining an aspiration channel,

a fluid inlet in communication with the fluid circulation space and configured to receive a cooling fluid from a fluid source via a positive gage pressure, and

an aspiration channel outlet in communication with the aspiration channel;

placing the fluid inlet in communication with a positive gage pressure source configured to provide cooling fluid to the fluid circulation space;

placing the aspiration channel outlet in fluid communication with a negative gage pressure source;

engaging the positive gage pressure source to provide cooling fluid to the first portion of the head within the fluid circulation space; and

engaging the negative gage pressure source to remove air from the aspiration channel to seal the rim of the cap to a second portion of the head.

42. A method for inducing hypothermia in a body to a preset temperature comprising:

placing a head-cooling device on a head of the body;

placing at least one body-cooling device on a second part of the body;

cooling the patient with the head-cooling device and the body-cooling device until the body temperature of the patient reaches a preset temperature;

discontinuing the head cooling with the head-cooling device while continuing cooling of the second part of the body with the body-cooling device to maintain the patient's body temperature at the preset temperature.

43. The method of claim 42 wherein the step of placing at least one body-cooling device on a second part of the body comprises placing a neck-cooling device on a second part of the body, the neck-cooling device having:

a collar;

a first body-cooling module attached to the collar, the first body-cooling module having a first fluid distribution membrane defining a plurality of fluid jets and having a first heat transfer membrane attached to the first fluid distribution membrane and configured to cover a first neck portion, the first fluid distribution membrane and the first heat transfer membrane defining a first fluid circulation chamber; and

a second body-cooling module attached to the collar, the second body-cooling module having a second fluid distribution membrane defining a plurality of fluid jets and having a second heat transfer membrane attached to the second fluid distribution membrane and configured to cover a second neck portion, the second fluid distribution membrane and the second heat transfer membrane defining a second fluid circulation

chamber.

44. A head-cooling device for inducing hypothermia comprising:

a cap having an outer surface and an inner surface;

a first sealing member disposed on the inner surface of the cap about a circumference defined by the cap, the first sealing member defining a first inner surface of the cap and a second inner surface of the cap, the first sealing member, the first inner surface of the cap, and a first portion of a head defining a fluid circulation space;

a second sealing member disposed on the second inner surface of the cap about a rim defined by the cap, the first sealing member, the second inner surface of the cap, and the second sealing member defining a channel;

a first fluid inlet in communication with the fluid circulation space and configured to receive a cooling fluid from a fluid source via a positive gage pressure; and

a second fluid inlet in communication with the channel and configured to receive fluid, via a positive gage pressure, to seal the rim of the cap to a second portion of the head, the pressure within the channel greater than the pressure within the fluid circulation space.

45. A tissue cooling device for inducing hypothermia comprising:

a tissue covering portion having an outer surface and an inner surface;

a first sealing member disposed on the inner surface of the tissue covering portion about an inner edge defined by the tissue covering portion, the first sealing member defining a first inner surface of the tissue covering portion and a second inner surface of the tissue covering portion, the first sealing member, the first inner surface of the tissue covering portion, and a first portion of a tissue region of interest defining a fluid circulation space;

a second sealing member disposed on the second inner surface of the tissue covering portion about an outer edge defined by the tissue covering portion, the first

sealing member, the second inner surface of the tissue covering portion, and the second sealing member defining an aspiration channel;

a fluid inlet in communication with the fluid circulation space and configured to receive a cooling fluid from a fluid source via a positive gage pressure; and

an aspiration channel outlet in communication with the aspiration channel and configured to remove air from the aspiration channel, via a negative gage pressure, to seal the outer edge of the tissue covering portion to a second portion of the tissue region of interest.

46. The tissue cooling device of claim 45 wherein the aspiration channel is configured to retrieve fluid from the fluid circulation space and wherein the aspiration channel outlet is configured to remove fluid retrieved by the aspiration channel.

47. The tissue cooling device of claim 45 wherein the tissue cooling device comprises a fluid outlet in communication with the tissue covering portion and in fluid communication with the fluid circulation space, the fluid outlet configured to allow egress of the cooling fluid from the fluid circulation space.

48. The tissue cooling device of claim 45 wherein the tissue cooling device defines a vent opening within the tissue covering portion, the vent opening configured to maintain the pressure within the fluid circulation space at substantially atmospheric pressure.

49. A cooling system for inducing hypothermia comprising:

a console having:

a housing;

a fluid reservoir in communication with the housing, the fluid reservoir configured to hold a cooling fluid;

a positive gage pressure source in communication with the housing, the

positive gage pressure source in fluid communication with the fluid reservoir; and

a negative gage pressure source in communication with the housing; and

a tissue cooling device having:

a tissue covering portion having an outer surface and an inner surface,

a first sealing member disposed on the inner surface of the tissue covering portion about an inner edge defined by the tissue covering portion, the first sealing member defining a first inner surface of the tissue covering portion and a second inner surface of the tissue covering portion, the first sealing member, the first inner surface of the tissue covering portion, and a first portion of a tissue region of interest defining a fluid circulation space,

a second sealing member disposed on the second inner surface of the tissue covering portion about an outer edge defined by the tissue covering portion, the first sealing member, the second inner surface of the tissue covering portion, and the second sealing member defining an aspiration channel,

a fluid inlet in communication with the fluid circulation space in fluid communication with the positive gage pressure source to receive a cooling fluid from the positive gage pressure source via a positive gage pressure, and

an aspiration channel outlet in communication with the aspiration channel and in fluid communication with the negative gage pressure source to remove air from the aspiration channel, via a negative gage pressure, to seal the outer edge of the tissue covering portion to a second portion of the tissue region of interest.

50. The cooling system of claim 49 wherein the aspiration channel is configured to retrieve fluid from the fluid circulation space and wherein the aspiration channel outlet is configured to remove fluid retrieved by the aspiration channel.

51. The cooling system of claim 49 wherein the tissue cooling device comprises a fluid outlet in communication with the tissue covering portion and in fluid communication

with the fluid circulation space, the fluid outlet configured to allow egress of the cooling fluid from the fluid circulation space.

52. The cooling system of claim 49 wherein the tissue cooling device defines a vent opening within the tissue covering portion, the vent opening configured to maintain the pressure within the fluid circulation space at substantially atmospheric pressure.

53. A tissue cooling device comprising:

a tissue covering portion having an outer surface and an inner surface, the tissue covering portion defining an edge and configured to cover a tissue region of interest;

an inlet in communication with the tissue covering portion, the inlet configured to distribute cooling fluid, under pressure from a pressure source, to the tissue region of interest; and

an aspiration channel disposed on the inner surface of the tissue covering portion about the edge defined by the tissue covering portion, the aspiration channel configured to fluidly communicate with a suction source to remove air from a space defined by the aspiration channel to seal the edge of the tissue covering portion to a periphery of the tissue region of interest.

54. The cooling device of claim 53 wherein the inner surface of the tissue covering portion defines a fluid channel in fluid communication with the inlet, the fluid channel having a plurality of fluid jets.

55. A cooling system for inducing hypothermia comprising:

a console having:

a housing;

a fluid reservoir in communication with the housing, the fluid reservoir configured to hold a cooling fluid;

a pressure source in communication with the housing, the pressure source in fluid communication with the fluid reservoir; and

a suction source in communication with the housing; and

a tissue cooling device having:

a tissue covering portion having an outer surface and an inner surface, the tissue covering portion defining an edge and configured to cover a tissue region of interest,

an inlet in communication with the tissue covering portion and in fluid communication with the pressure source, the inlet configured to distribute cooling fluid, under pressure from the pressure source, to the tissue region of interest, and

an aspiration channel disposed on the inner surface of the tissue covering portion about the edge defined by the tissue covering portion, the aspiration channel in fluid communication with the suction source to remove air from a space defined by the aspiration channel to seal the edge of the tissue covering portion to a periphery of the tissue region of interest.

56. The cooling system of claim 55 wherein the inner surface of the tissue covering portion defines a fluid channel in fluid communication with the inlet, the fluid channel having a plurality of fluid jets.